


Family Health Dataline

IN THIS ISSUE:

- Five black or Alaska Native breast-fed infants were diagnosed with vitamin D-deficiency rickets during 1993-96.
- Presenting complaints included abnormal gait, seizures, growth delay, and bowed legs.
- Three of the five infants had a height-for-age less than the 10th percentile.
- Physical findings included rachitic rosary, frontal bossing, and enlarged wrists while roentgenographic examination revealed cupping and fraying of the ends of long bones.
- Health care providers should provide vitamin D supplementation to all high-risk infants in Alaska, particularly Alaska Native and black infants who are partially or exclusively breast-fed.

 *Results of the Reader Survey are on the back page. Thank you for your participation.*

Nutritional Rickets Among Breast-fed Black and Alaska Native Children

Introduction

Vitamin D deficiency rickets occurs "as a result of low vitamin D intake in association with decreased exposure to sunlight" (Kruse 1995). Today rickets occurs primarily in underdeveloped countries. Despite this, rickets remains a risk for infants in North America, particularly those with dark skin or who breast-feed (Sills et al, 1994; Wilton, 1995). This issue of the Family Health Dataline presents five infants diagnosed with vitamin D deficiency rickets by five physicians at the Anchorage Neighborhood Health Center, the Alaska Native Medical Center, and Elmendorf Airforce Base.

Results

The five infants were diagnosed during 1993 to 1996. Their ages ranged from 12 to 20 months, three were black and two Alaska Natives, and patients were diagnosed during every season except summer (Table 1). All of the infants were breast-fed and the oldest three infants had a history of refusing most non-breast milk products. None of the infants and one of the mothers were reported to be taking vitamin supplementation.

The presenting complaints included seizures, abnormal gait, bowed legs, and growth delay. None of the infants were born prematurely. Physical findings included rachitic rosary, frontal bossing, large wrists, and bowed legs (Table 2). Three of the five infants had a height-for-age less than the 10th percentile at presentation. Abnormal laboratory findings included a low serum calcium and phosphorus and an elevated alkaline phosphatase (Table 3). Four of the infants had a radiologic examination of one or more long bones and all four showed cupping and fraying typical of nutritional rickets.

All five infants were treated with vitamin D2. Four infants received prolonged vitamin D therapy (up to 4 months) while one infant received a one time dose of 100,000 units. Follow-up examination showed reduced or resolved cupping and fraying of the long bones on radiologic exami-

Table 1. Demographic features and diet for five infants diagnosed with vitamin D-deficiency rickets; Alaska, 1993-96

Case number	Age (in mos)	Month of presentation	Residence	Gender	Race	Diet
1	11.8	January	Ketchikan	Male	AK Native	Breast milk, table food
2	12.9	September	Anchorage	Female	Black	Breast milk, table food
3	20.3	September	Anchorage	Female	AK Native	Breast + bottle, table food Refused most non-breast milk, reported to have a possible milk allergy.
4	18.3	January	Anchorage	Female	Black	Breast + bottle, table food Refused most non-breast milk.
5	14.0	April	Anchorage	Male	Black	Breast, table food Refused other milk intake except ice cream.

Table 2. Symptoms and physical findings at presentation for five infants with vitamin D-deficiency rickets; Alaska, 1993-96.

Case number	Presenting symptom	Other symptoms	Height-for-age percentile	Weight-for-age percentile	Other physical findings
1	Tonic/clonic seizure	Anorexia, lethargy	25	75	Rachitic rosary, frontal bossing
2	Abnormal gait	—	<5	<5	Pot belly, bilateral hip click
3	Bow legs	—	25	50	Rachitic rosary
4	Abnormal gait	—	5	50	Rachitic rosary
5	Growth delay	Not walking	<5	10	Rachitic rosary, large wrists, bowed legs

Table 3. Serum chemistry levels for five infants with vitamin D-deficiency rickets; Alaska, 1993-96.

Case number	Calcium in mg/dL (Normal = 8.8 to 10.8)	Phosphorus in mg/dL (Normal = 3.8 to 6.5)	Alkaline phosphatase in U/L (normal values)	25-hydroxy vitamin D in ng/ml (normal values)
1	5.9	3.1	326 (80 to 350)	—
2	8.7	2.8	1051 (38 to 126)	—
3	9.7	3.9	555 (40 to 417)	6 (10 to 55)
4	8.2	2.1	1218 (50 to 270)	—
5	6.8	4.1	2278 (50 to 270)	—

nation, normalization of serum calcium and phosphate values, and a decrease of serum alkaline phosphatase values. Despite this, the height-for-age of one infant (case number 3) remained well below the 5th percentile seven months after treatment for rickets, the height-for-age of a second infant (case number 5) improved from the 5th to the 25th percentile six months after treatment but remained well below the 99th percentile which the child maintained before the onset of rickets, and the height-for-age of a third child (case number 6) increased from less than the 5th to the 5th percentile two

months after the diagnosis of rickets but remained below the 50th to 75th percentile which the child maintained before the diagnosis of rickets.

Discussion

The five children presented here illustrate some of the diverse presentations of rickets, including seizures, bowed legs, growth delay, and abnormal gait (Ahmed et al, 1995; Hag and Karrar, 1995). Other symptoms may include delayed developmental milestones and generalized weakness. Physical findings include rachitic rosary, craniotabes, frontal bossing, thickened wrists,

bowed legs, and scoliosis or kyphosis. Additionally, infants may have delayed growth, as seen for three of the children presented here. Unfortunately, stunting due to rickets may take years to resolve or may never fully resolve (Barnes and Curran, 1996) thus emphasizing the importance of prevention. Typically patients have low serum calcium, low or normal phosphorous, and elevated alkaline phosphatase levels although values for all of these may be normal. Roentgenographic evaluation typically shows cupping and fraying of the ends of long bones. Serum vitamin D levels can confirm the di-

agnosis of nutritional rickets.

The predominant risk factors for rickets among northern populations include breast-feeding and dark skin. This was true for the five patients in this report as well: all of the infants breast-fed and all were either Alaska Native or black. Interestingly, none of the children were exclusively breast-fed and three children had other forms of milk intake besides breast-milk. Although not included in this case series, a 6-month-old Alaska Native infant whose only milk source was breast-milk presented during 1984 with nutritional rickets and low serum vitamin D levels, this infant also ate table foods.

The optimal method for preventing rickets has not been determined. Exposing infants to sunlight is a simple and inexpensive therapy but for some people in Alaska during the winter the quantity of ultraviolet radiation may not reach the threshold required for vitamin D synthesis regardless of the exposure time. For example, in Edmonton at latitude 52°, the level of ultraviolet radiation is insufficient for vitamin D synthesis from October through April. (Fomon and Eckerd, 1993). Additionally, ultraviolet radiation does not penetrate glass windows.

The dose of vitamin D which breast-feeding mothers must take to prevent rickets is not known but may be as high as 2000 IU per day, a dose whose long-term side effects for the mother are not known (Ala-Houhala et al, 1986). Another strategy is to provide a daily vitamin D supplement of

400 IU to breast-feeding infants. The American Academy of Pediatrics recommends this course for exclusively breast-fed infants under certain climatic and social conditions (Fomon et al, 1979); none of our patients, however, were exclusively breast-fed. Finally at least two authors have recommended supplementing high-risk infants and their mothers (Haworth, 1995; Ahmed et al, 1995). Of particular relevance to Alaskans is the recommendation of the Canadian Pediatric Society that vitamin D supplementation be provided for "all infants and pregnant and lactating women in northern communities."

The prevalence of rickets in Alaska is not known. The cases presented here represent those known by the five physicians who reported them to have occurred during 1993-96. Additionally, these patients had rickets which had progressed to become clinically apparent. It is likely that many more cases of rickets exist in Alaska which cause less severe symptoms and thus are not diagnosed.

To decrease the impact of this illness on the health of Alaskan children, health care providers must maintain a high index of suspicion for this illness, particularly among breast-fed and black or Alaska Native infants, and must take a thorough nutritional history. Primary prevention should include vitamin D supplementation for all high-risk infants, including breast-fed black and Alaska Native infants. Maternal vitamin D intake may provide additional protection against

rickets but should not be used as the sole preventative measure.

*Submitted by Brad D. Gessner,
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1996 Family Health Dataline Reader Survey Report

The Section of Maternal, Child, and Family Health enclosed a one page reader survey with the May/June 1996 Family Health Dataline (vol. 2, no.5). Nine questions surveyed readability, interest, relevance, and reader characteristics. During the following month, 47 readers returned surveys.

Forty-six (97%) of the 47 survey respondents read the Dataline. Fifteen (32%) respondents believed that the Dataline was highly interesting and 24 (51%) believed that it was interesting. None of the respondents believed that it was uninteresting. Seventeen (36%) respondents believed that the Dataline was very helpful and 28 (60%) found it somewhat helpful. Forty-four (94%) respondents believed the information in the Dataline was timely. When asked about the readability of text, 32 (68%) felt that the information was easy to understand and 13 (28%) found it fairly readable. With regards to layout of the text, figures, and tables, 41 (87%) of the respondents felt that it was attractive and easy to read.

Ages of respondents ranged from 28 years to 69 years (mean 52). The most common occupations of respondents were physicians (32%), nurses (23%), dietitians (4.3%), and nutritionists (4.3%). Other occupations included educator, various health or early intervention providers, manager, journalist, legislator, and epidemiologist.

The survey asked readers to suggest up to three topics for future issues of the Dataline. The most common responses were adolescent health issues (31%) including teen pregnancy, substance abuse, birth control, and sexually transmitted diseases; infant and child issues (29%) including daycare, early intervention, health, mortality, prenatal exposure, adoption, immunization, and injury; women's issues (19%), including miscarriages, breastfeeding, pap smears, home visitation, prenatal care and Group B Streptococcal screening; domestic violence (13%), including child and spouse abuse, family violence, and intervention; and family issues (4%), including parenting and family planning

Submitted by Kaye Saxon

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